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A new species of *Hydropisphaera, H. bambusicola,* is the sexual state of *Gliomastix fusigera*

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Abstract — *Hydropisphaera bambusicola* sp. nov. (*Bionectriaceae*, *Hypocreales*) is described and illustrated based on a collection from *Bambusa vulgaris* in Martinique. The asexual state was obtained in culture and identified as *Gliomastix fusigera*. *Gliomastix fusigera* is an anamorphic species that occurs on members of the *Arecaceae* and *Poaceae* throughout the tropics and for which no sexual state is known. *Hydropisphaera bambusicola* is distinctive in having aseptate, striate ascospores. All other species of *Hydropisphaera* and most species of the *Bionectriaceae* have one or more septate ascospores. *Hydropisphaera bambusicola* and eight other species in *Hydropisphaera* are unusual in having fasciculate hairs near the perithecial apex. A key to the species of *Hydropisphaera* with hairs is presented.

Key words — *Acremonium*, *Ascomycota*, bamboo, *Ijuhya*, *Protocreopsis*

Introduction

The genus *Hydropisphaera* Dumort., based on the type species *H. peziza* (Tode) Dumort., was established by Dumortier (1822), but was long considered to be a synonym of the genus *Nectria* (Fr.) Fr. Rossman et al. (1999) resurrected *Hydropisphaera* as a distinct genus in the *Bionectriaceae* (*Hypocreales*) for species of *Nectria*-like fungi that had previously been placed in the *N. peziza* group (Booth 1959, Samuels 1976, Rossman 1983). The ascomata of *Hydropisphaera* are yellow, orange to brown, and do not change color in potassium hydroxide or lactic acid, which is characteristic of the *Bionectriaceae*. *Hydropisphaera* is distinguished from other genera in the *Bionectriaceae* by the relatively wide ascomatal wall, greater than 25 µm wide, composed of thin-walled cells that often collapse upon drying to form cupulate perithecia. Rossman et al. (1999) recognized 18 species in *Hydropisphaera* and five additional species have been

added since then. Where known, the asexual states of species of *Hydropisphaera* are considered to be *Acremonium*-like.

During the course of a research program on the fungal diversity of the Lesser Antilles, an interesting specimen of the genus *Hydropisphaera* was discovered in Martinique and it was determined to represent a previously undescribed species. This specimen was cultured from single ascospores that produced an asexual state that was identified as *Gliomastix fusigera*. This new species and its asexual state are described and illustrated below. DNA sequence data from the ITS region and the nLSU rRNA gene have been deposited in GenBank.

Materials & methods

Specimens were examined using the methods described by Rossman et al. (1999). Microscopic observations and measurements were made in water, and ascospore ornamentation was observed in lactic cotton blue. In the descriptions, an ^{m} indicates average or mean, and n is the number of structures that were measured. Sequence data from the ITS region and the nLSU rRNA gene were obtained via the methods of Samuels et al. (2009) and submitted to GenBank.

Taxonomy

Hydropisphaera bambusicola Lechat, **sp. nov.** Figs. 1–2

Mycobank mb 515218; GenBank GU059594 (ITS) & GU059595 (nLSU rRNA)

Ascomata subglobosa, apice applanata, 220–260 µm alta, diametro 300–360 µm diametro, aurantius vel rubro bruneus, corona subapicalis pilis agglutinatis aurantia, crasse-tunicatis, flexuosis composita, colore in KOH vel acido lactico non mutanda. Asci 90–96 × 12–16 µm, octospori, unitunicati, inamyloidei. Ascosporae fusiformes, (18.5–)20–24.8(–28.2) × (4.8–)5.2–7(–8.2) µm, hyalinae, aseptatae, striatae.

Holotypus: *French West Indies. Martinique. Prêcheur, Anse Couleuvre, sentier de la cascade Couleuvre, in culmis emortuis Bambusa vulgaris, 25.VIII.2008, leg. Christian Lechat CLL8323 (LIP), ex-typus in CBS 124147.*

Etymology: The epithet is derived from the host genus of the substrate.

Perithecia solitary or crowded in groups of 2–10, superficial, subglobose, (200–)220–260(–300) µm high × (250–)300–360 µm diam. (^{m} = 250 × 325 µm, n = 20), reddish-brown, collapsing cupulate when dry, not changing color in 3% KOH or lactic acid. Perithecial apex with short, acute papilla, margin with fasciculate, thick-walled hairs, arising from cells of ascomatal wall, hairs agglutinated to form triangular teeth, hairs arranged in a stellate fringe around upper margin of perithecia. Hairs 80–100 µm long, 2.5–3 µm wide, brownish-orange, cylindrical, slightly flexuous, thick-walled (0.8–1.5 µm), rounded at tips, septate. Perithecial wall 50–70 µm thick, composed of two regions: outer region 30–50 µm wide, of globose to ellipsoidal 15–20 × 12–15 µm cells,

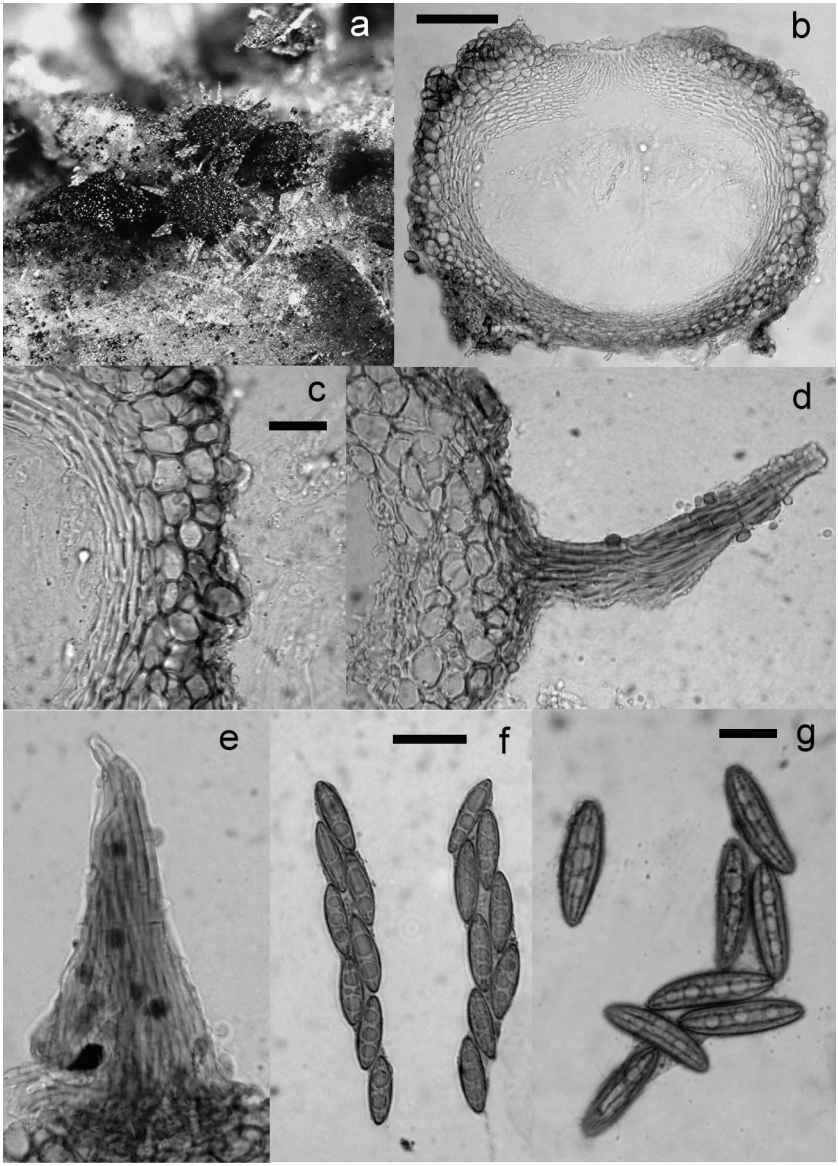

Fig. 1. *Hydropisphaera bambusicola* (based on holotype material). a. Perithecia. b. Median section of perithecium. c. Median section of perithecial wall. d–e. Fasciculate hairs. f. Asci. g. Ascospores.

Scale bars = 50 µm for b, 20 µm for c–f; use bar in c for c–e, 10 µm for g. Note: ascospores were stained with lactic cotton blue. Additional photos at http://www.ascofrance.fr.

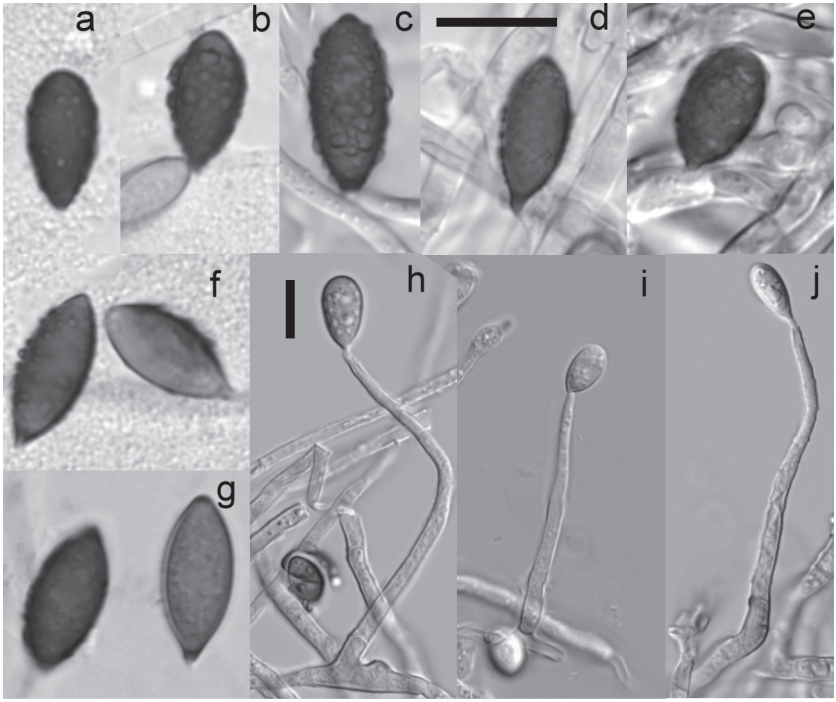

Fig. 2. *Gliomastix fusigera* (based on culture obtained from single ascospore isolate of holotype of *Hydropisphaera bambusicola*). a–g. Conidia. h–j. Conidiophores and conidiogenous cells. Scale bars = 10 µm for all; use bar in d for a–g and bar in h for h–j.

with yellow to orange walls 1–1.5 µm thick; inner region 15–20 µm wide, of elongate, flattened cells 10–15 × 5–7 µm, with hyaline walls 1.5–2 µm thick. Basal hyphae hyaline to yellowish, 3–3.5 µm diam., flexuous, smooth. Asci (85–)90–96(–100) × (10–)12–16(–17) µm (^{m} = 94.5 × 14 µm, n=20), clavate, apices rounded, without ring, with 8 biseriate ascospores. Ascospores (18.5–)20–24.8(–28.2) × (4.8–)5.2–7(–8.2) µm (^{m} = 23.6 × 6.7 µm, n=30), fusiform, aseptate, hyaline, striate with striations finely verrucose.

Anamorph

Gliomastix fusigera (Berk. & Broome) C.H. Dickinson, Mycol. Pap. 115: 7. 1968.

≡ *Monotospora fusigera* Berk. & Broome, J. Linn. Soc., Bot. 14: 99. 1873.

≡ *Acremonium fusigerum* (Berk. & Broome) W. Gams, *Cephalosporium*-artige Schimmelpilze (*Hyphomycetes*): 94. 1971.

In Culture: Colony after one week on PDA, 11–12 mm diam., regularly cottony-fluffy hyphae, olivaceous grey, white at margin, reverse olivaceous grey, lacking sporulation; after two weeks, 24 mm diam., cottony-fluffy hyphae

with greater height towards the middle, otherwise appearing similar, but with light sporulation; after one week on CMA, 18 mm diam., thin sparse aerial hyphae, hyaline, sporulating, reverse hyaline; after two weeks, 36 mm diam., appearance same as one week.

Mycelium with hyphae branching, septate, hyaline to pale brown, smooth, width 3–5 µm. Conidiophores borne on aerial hyphae, macronematous, mononematous, unbranched, elongate, erect, straight to flexuous, hyaline to light brown, surface smooth to very faintly roughened. Conidiogenous cells integrated, monophialidic, terminal, subulate towards apex, at times with a minutely flared collarette, length 31–60 µm with width at apex 1.5–2 µm and at base 3–4.5 µm. Conidia solitary or catenulate in short chains, obpyriform to fusiform with apices rounded to somewhat acute and bases having a prominent, almost apiculate hilum, aseptate, walls smooth to verrucose, hyaline becoming dark brown with ends at times paler and dark brown to black in mass, 6.3–17.2 × 5.0–8.5 µm (^{m} = 13.2 × 6.6 µm, n = 73).

Additional specimen examined: USA. Florida: Miami-Dade Co. north miami, enchanted forest elaine park, on rachis of dead *Sabal palmetto* leaf, 30.VI.2007, leg. Gregorio Delgado. (BPI *878844*).

The above description includes data from the anamorphic culture obtained from the single ascospore isolate of the holotype of *Hydropisphaera bambusicola*.

Discussion

Hydropisphaera bambusicola is placed in the genus *Hydropisphaera* based on the brownish-orange, KOH–, lactic acid– ascomatal wall of large, thin-walled cells that result in cupulate perithecia upon drying. This species appears similar to species of *Ijuhya* Starbäck, many of which have fasciculate hairs around the perithecial apex, striate ascospores, and occur on monocotyledonous plants. However, *H. bambusicola* differs from species of *Ijuhya* in that the latter have an ascomatal wall composed of cells with a thickened wall and the perithecia generally do not become cupulate upon drying. The ascospores of *H. bambusicola* resemble those of *Protocreopsis* Yoshim. Doi in being coarsely striate with striae that are somewhat wavy. In addition, most species of *Protocreopsis* occur on monocotyledonous plants. However, *Hydropisphaera bambusicola* is unlike species of *Protocreopsis* in that it lacks white to tan hyphae that envelop the ascomatal wall.

Within the genus *Hydropisphaera*, a number of known species have an apical crown of long, fasciculate hairs, and a key to such species is presented below. *Hydropisphaera bambusicola* differs from all species of *Hydropisphaera* in having non-septate ascospores. The known asexual state for species of *Hydropisphaera* is considered *Acremonium*-like with hyaline, non-septate conidia borne on unbranched conidiophores similar to those known for species of *Ijuhya*. None

of these species have an asexual state resembling the characteristic *Gliomastix* asexual state of *H. bambusicola*.

The anamorph of *H. bambusicola* belongs to the genus *Gliomastix* Guég. as *G. fusigera*, which was redescribed by Dickinson (1968). This anamorph has been reported on monocotyledonous hosts, specifically species in the *Arecaceae* and *Poaceae* in tropical regions. Although primarily known from the Old World, especially in Asia (Matsushima 1975, Zhuang 2001), several reports including a recent mention of this species on *Sabal palmetto* in Florida, USA (Delgado 2009) suggest that *G. fusigera* is pantropical. *Gliomastix fusigera* is one of the two species of *Gliomastix* having conidia that are typically much longer than 12 µm. The other species, *G. elata* C.H. Dickinson, has narrowly fusiform conidia and is known from *Musa* in Sierra Leone (Dickinson 1968, Ellis 1971). Since the anamorph of *Wallrothiella subiculosa* Höhn. was transferred to *Pseudogliomastix* W. Gams (Gams & Boekhout 1985), no other sexual state is known for any species of *Gliomastix*. Gams (1971) regarded *Gliomastix* as a synonym of *Acremonium* Link and classified all species in that genus as *Acremonium* section *Gliomastix* (Guég.) W. Gams. This study confirms the prediction that these fungi would be connected to a sphaeriaceous teleomorph (Gams 1978). However, based on the dark brown conidia that contrast with the hyaline conidia of true *Acremonium*, many authors have regarded *Gliomastix* as a distinct genus (Dickinson 1968, Ellis 1971, Hammill 1981, Delgado 2009). The type of *Gliomastix* is *Gliomastix chartarum* (Corda) S. Hughes, a species which is now correctly given the name of the taxonomic synonym, *Gliomastix murorum* (Corda) S. Hughes (≡ *Acremonium murorum* (Corda) W. Gams). DNA sequence similarity and our preliminary, unpublished phylogenetic analyses suggest *Hydropisphaera bambusicola* with its *G. fusigera* anamorph is closely related to the type of *Gliomastix* as well as species of *Hydropisphaera*. Schoch et al. (2009) also showed a close relationship between *Gliomastix* and *Hydropisphaera*. Since the type of *Acremonium*, *Acremonium alternatum* Link, appears to belong to a different clade of the *Bionectriaceae* and that for some time *Acremonium* has been thought of as polyphyletic, we feel that the use of *Gliomastix* as a form genus distinct from *Acremonium* is warranted.

Key to species of *Hydropisphaera* with fasciculate hairs

(Modified from Rossman et al. 1999)

1. Ascospores averaging more than 25 µm long **2**
1. Ascospores averaging less than 25 µm long **4**
2. Ascomata dark red with red hairs; ascospores spinulose-striate . . . . . ***H. haematites*** (Syd. & P. Syd.) Rossman & Samuels
2. Ascomata dark orange to brown with concolorous hairs; ascospores smooth-walled **3**

3. Ascospores 48–55 × 6–7 µm; ascomata dark orange with orange hairs ..... ***H. gigantea*** (Speg.) Rossman & Samuels
3. Ascospores 25–38 × 5–7 µm; ascomata brown with brown hairs ..... ***H. dolichospora*** (Penz. & Sacc.) Rossman & Samuels
4. Ascomata with white to orange, fasciculate hairs; ascospores averaging more than 17 µm long **5**
4. Ascomata with white, fasciculate hairs; ascospores averaging less than 17 µm long **7**
5. Ascospores aseptate ..... ***H. bambusicola***
5. Ascospores one-septate **6**
6. Ascomata orange with orange hairs; ascospores 17–23 × 5–7 µm, striate ..... ***H. cyatheae*** (Dingley) Rossman & Samuels
6. Ascomata yellow to nearly brown with white hairs; ascospores 16–22 × 4–5 µm, striate or spinulose ..... ***H. leucotricha*** (Penz. & Sacc.) Rossman & Samuels
7. Ascospores striate; ascomata pale yellow to yellow ..... ***H. suffulta*** (Berk. & M.A. Curtis) Rossman & Samuels
7. Ascospores smooth or spinulose, not striate; ascomata orange to dark orange **8**
8. Ascospores 12.5–17.5 × 3.5–4 µm, spinulose ..... ***H. rufofusca*** (Penz. & Sacc.) Rossman & Samuels
8. Ascospores 12–15 × 4–5 µm, smooth ..... ***H. boothii*** (D. Hawksw.) Rossman & Samuels

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